- **Very Low Dropout Voltage, Less Than 0.6 V at 750 mA**
- **Low Quiescent Current**
- **TTL- and CMOS-Compatible Enable on TL751M Series**
- **60-V Load-Dump Protection**
- **Overvoltage Protection**
- **Internal Thermal Overload Protection**
- **Internal Overcurrent Limiting Circuitry**

## description

The TL750M and TL751M series are low-dropout positive voltage regulators specifically designed for battery-powered systems. The TL750M and TL751M incorporate on-board overvoltage and current-limit protection circuitry to protect the TL75xM devices and the regulated system. Both series are fully protected against 60-V load-dump and reverse battery conditions. Extremely low quiescent current, even during full-load conditions, makes the TL750M and TL751M series ideal for standby power systems.

The TL750M series of fixed-output voltage regulators offers 5-V, 8-V, 10-V, and 12-V options available in 3-lead KC (TO-220AB) and KTE plastic packages.

The TL751M series of fixed-output voltage regulators also offers 5-V, 8-V, 10-V, and 12-V options with the addition of an enable input. The enable input gives the designer complete control over power up, allowing sequential power up or emergency shutdown. When taken high, the enable input places the regulator output in a high-impedance state. The enable input is completely TTL- and CMOS-compatible. The TL751M series is offered in 5-lead KTG plastic packages.

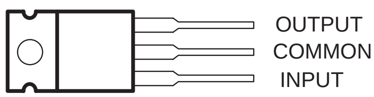
The TL750MxxC and TL751MxxC are characterized for operation from 0°C to 125°C virtual junction temperature, and the TL750MxxQ and TL751MxxQ series are characterized for operation from –40°C to 125°C virtual junction temperature. The TL751M05M and TL751M12M are characterized for operation over the full military temperature range of –55°C to 125°C.

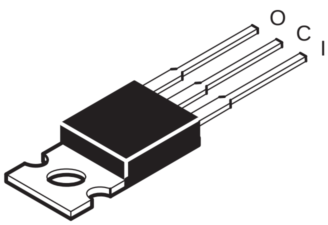
**AVAILABLE OPTIONS**

| $T_J$ | $V_O$ TYP (V) | PACKAGED DEVICES | | | | | | CHIP FORM (Y) |
|---|---|---|---|---|---|---|---|---|
| | | CHIP CARRIER (FK) | CERAMIC DIP (JG) | HEAT-SINK MOUNTED (3-PIN) (KC) | PLASTIC FLANGE MOUNT (KTE)† | PLASTIC FLANGE MOUNT (KTG)† | PLASTIC FLANGE MOUNT (KTP)† | |
| 0°C to 125°C | 5 | — | — | TL750M05CKC | TL750M05CKTE | TL751M05CKTG | TL750M05CKTP | TL750M05Y |
| | 8 | — | — | TL750M08CKC | TL750M08CKTE | TL751M08CKTG | TL750M08CKTP | TL750M08Y |
| | 10 | — | — | TL750M10CKC | TL750M10CKTE | TL751M10CKTG | TL750M10CKTP | TL750M10Y |
| | 12 | — | — | TL750M12CKC | TL750M12CKTE | TL751M12CKTG | TL750M12CKTP | TL750M12Y |
| –40°C to 125°C | 5 | — | — | TL750M05QKC | TL750M05QKTE | TL751M05QKTG | — | — |
| | 8 | — | — | TL750M08QKC | TL750M08QKTE | TL751M08QKTG | — | — |
| | 10 | — | — | TL750M10QKC | TL750M10QKTE | TL751M10QKTG | — | — |
| | 12 | — | — | TL750M12QKC | TL750M12QKTE | TL751M12QKTG | — | — |
| –55°C to 125°C | 5 | TL751M05MFK | TL751M05MJG | — | — | — | — | — |
| | 12 | TL751M12MFK | TL751M12MJG | — | — | — | — | — |

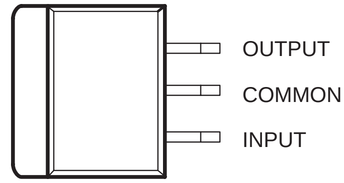
† The KTE and KTG packages also are available taped and reeled. The KTP is only available taped and reeled.

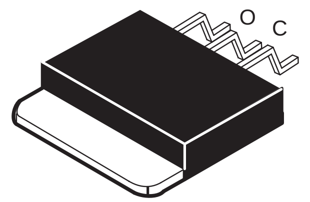
**TL750M . . . 3-LEAD KC (TO-200AB) PACKAGE†**
**(TOP VIEW)**



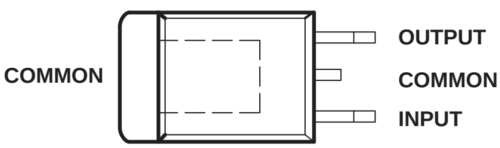



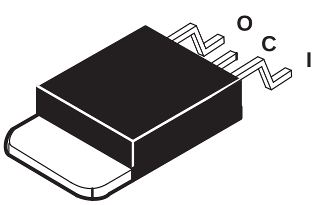

**TL750M . . . 3-LEAD KTE PACKAGE†**
**(TOP VIEW)**



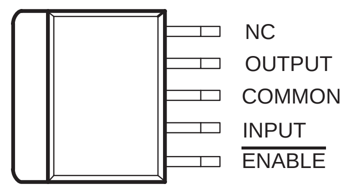



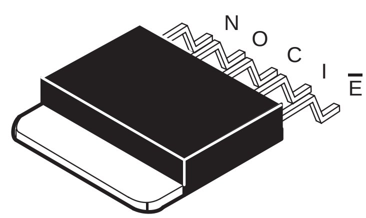

**TL750M . . . KTP PACKAGE†**
**(TOP VIEW)**



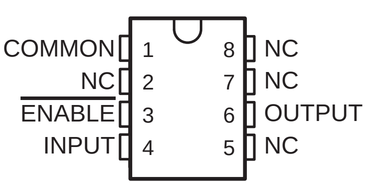




**TL751M . . . 5-LEAD KTG PACKAGE†**
**(TOP VIEW)**

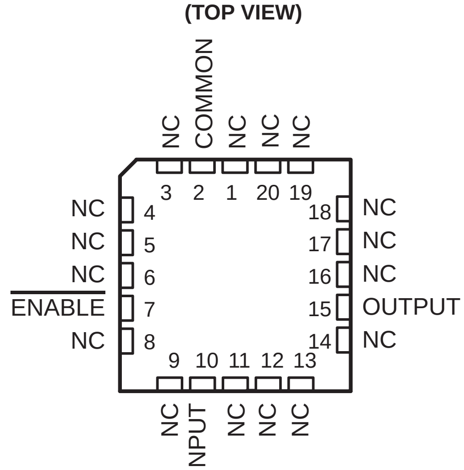



**TL751M . . . JG PACKAGE**
**(TOP VIEW)**



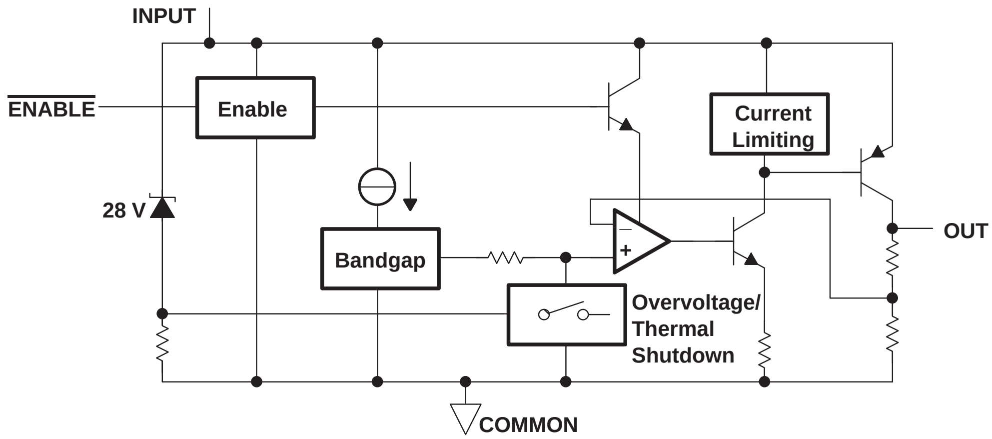

**TL751M . . . FK PACKAGE**
**(TOP VIEW)**




NC – No internal connection

† The common terminal is in electrical contact with the mounting base.

## TL751Mxx functional block diagram

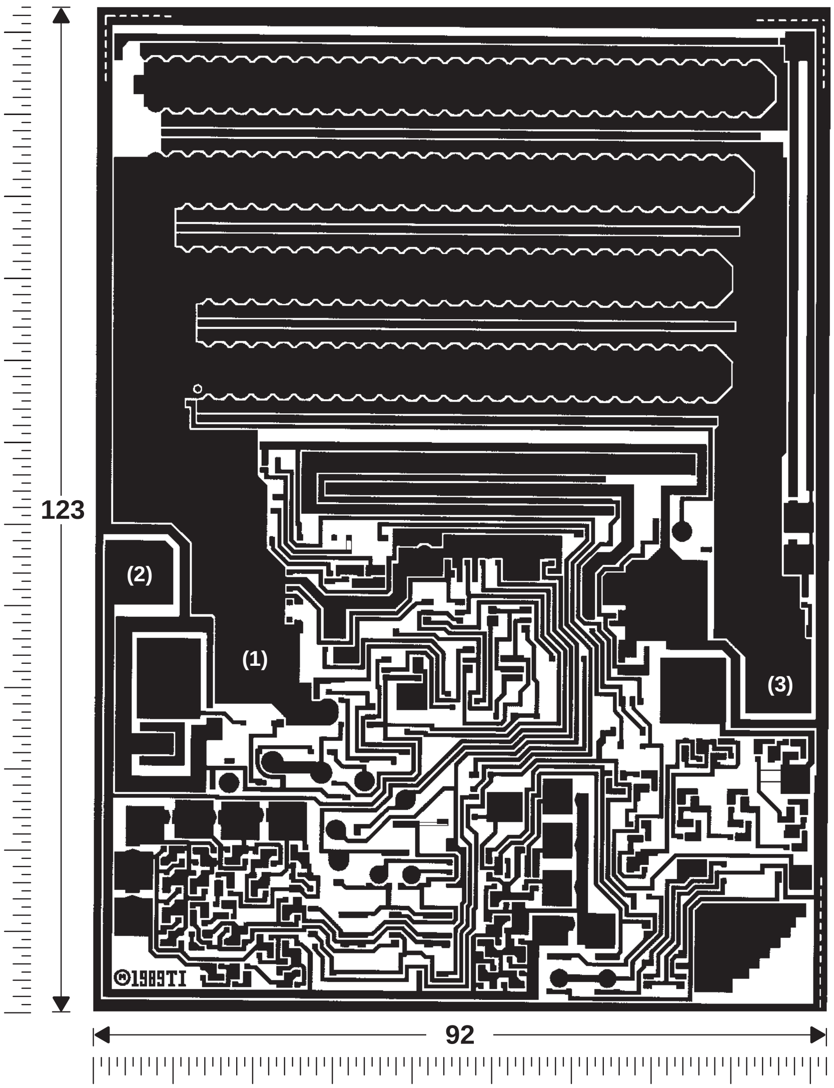


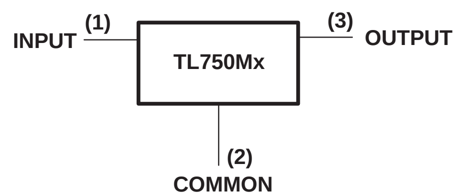

| DEVICE COMPONENT COUNT | |
|---|---|
| Transistors | 46 |
| Diodes | 14 |
| Resistors | 44 |
| Capacitors | 4 |
| JFET | 1 |
| Tunnels (emitter R) | 2 |

## TL750MxxY chip information

This chip, when properly assembled, displays characteristics similar to the TL750MxxC. Thermal compression or ultrasonic bonding can be used on the doped-aluminum bonding pads. The chip can be mounted with conductive epoxy or a gold-silicon preform.

**BONDING PAD ASSIGNMENTS**




**CHIP THICKNESS: 11 MILS TYPICAL**
**BONDING PADS: 7 X 7 MILS MINIMUM**
**$T_J$(max) = 150°C**
**TOLERANCES ARE ±10%**
**ALL DIMENSIONS ARE IN MILS**

## absolute maximum ratings over virtual junction temperature range (unless otherwise noted)†

Continuous input voltage . . . . . 26 V
Transient input voltage (see Figure 5) . . . . . 60 V
Continuous reverse input voltage . . . . . –15 V
Transient reverse input voltage: t = 100 ms . . . . . –50 V
Continuous total power dissipation at (or below) $T_A$ = 25°C . . . . . See Dissipation Rating Tables
Continuous total power dissipation at (or below) $T_C$ = 40°C:
FK Package . . . . . 5.5 W
JG Package . . . . . 3.9 W
All other packages (see Note 1) . . . See Dissipation Rating Tables
Operating free-air ($T_A$) case ($T_C$) or virtual-junction ($T_J$) temperature range . . . . . –40°C to 150°C
Storage temperature range, $T_{stg}$ . . . . . –65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds . . . . . 260°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTE 1: For operation above $T_A$ = 25°C and $T_C$ = 40°C, refer to Figures 1 and 2. To avoid exceeding the design maximum virtual junction temperature, these ratings should not be exceeded. Due to variation in individual device electrical characteristics and thermal resistance, the built-in thermal overload protection may be activated at power levels slightly above or below the rated dissipation.

**DISSIPATION RATING TABLE — FREE-AIR TEMPERATURE**

| PACKAGE | $T_A \le$ 25°C POWER RATING | DERATING FACTOR ABOVE $T_A$ = 25°C | $T_A$ = 70°C POWER RATING | $T_A$ = 105°C POWER RATING | $T_A$ = 125°C POWER RATING |
|---|---|---|---|---|---|
| FK | 1920 mW | 15.4 mW/°C | 1227 mW | 688 mW | 380 mW |
| JG | 1050 mW | 8.4 mW/°C | 672 mW | 378 mW | 210 mW |
| KC | 2000 mW | 16 mW/°C | 1280 mW | 720 mW | 400 mW |
| KTE/KTG | 1900 mW | 15.2 mW/°C | 1216 mW | 684 mW | 380 mW |
| KTP | 1800 mW | 14.5 mW/°C | 1147 mW | 653 mW | 363 mW |

**DISSIPATION RATING TABLE — CASE TEMPERATURE**

| PACKAGE | $T_C \le$ 90°C POWER RATING | DERATING FACTOR ABOVE $T_C$ = 90°C | $T_C$ = 125°C POWER RATING |
|---|---|---|---|
| KC | 15000 mW | 250 mW/°C | 6250 mW |
| KTE/KTG | 14300 mW | 238 mW/°C | 5970 mW |
| KTP | 13000 mW | 217 mW/°C | 5417 mW |

**FREE-AIR TEMPERATURE DISSIPATION DERATING CURVE**

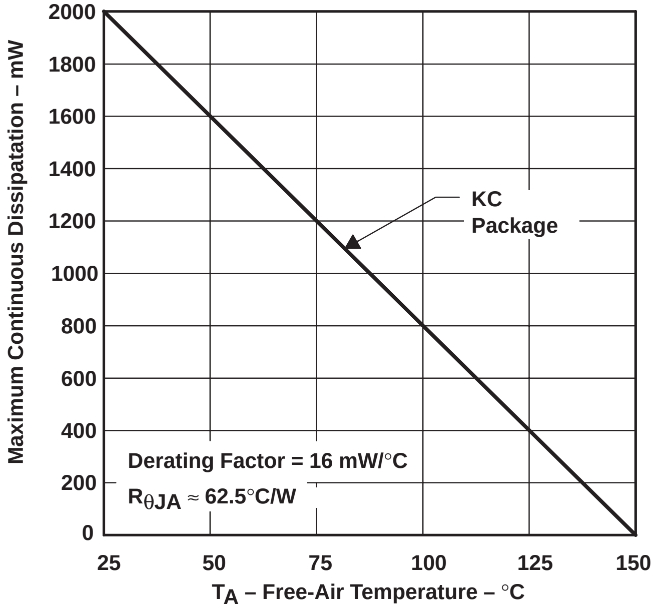



Figure 1

**CASE TEMPERATURE DISSIPATION DERATING CURVE**

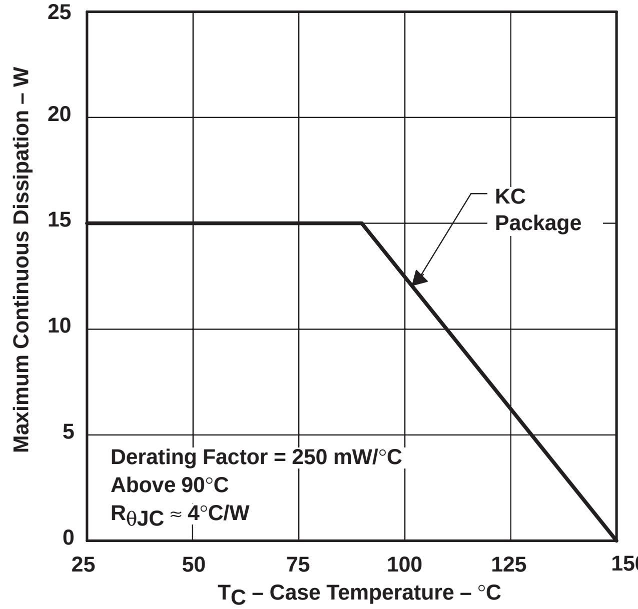



Figure 2

## recommended operating conditions over recommended virtual junction temperature range

| | | MIN | MAX | UNIT |
|---|---|---|---|---|
| Input voltage range, $V_I$ | TL75xM05 | 6 | 26 | V |
| | TL75xM08 | 9 | 26 | |
| | TL75xM10 | 11 | 26 | |
| | TL75xM12 | 13 | 26 | |
| High-level $\overline{\text{ENABLE}}$ input voltage, $V_{IH}$ | TL751Mxx | 2 | 15 | V |
| Low-level $\overline{\text{ENABLE}}$ input voltage, $V_{IL}$ | TL751Mxx | 0 | 0.8 | |
| Output current range, $I_O$ | TL75xMxxC, TL75xMxxQ | | 750 | mA |
| | TL751MxxM | | 480 | mA |
| Operating virtual junction temperature range, $T_J$ | TL75xMxxC | 0 | 125 | °C |
| | TL75xMxxQ | –40 | 125 | |
| | TL75xMxxM | –55 | 125 | |

## electrical characteristics, $V_I$ = 14 V, $I_O$ = 300 mA, $T_J$ = 25°C

| PARAMETER | TL751Mxxx | | | UNIT |
|---|---|---|---|---|
| | MIN | TYP | MAX | |
| Response time, $\overline{\text{ENABLE}}$ to output | | 50 | | µs |

## electrical characteristics, $V_I$ = 14 V, $I_O$ = 300 mA, $\overline{ENABLE}$ at 0 V for TL751M05, $T_J$ = 25°C (unless otherwise noted) (see Note 2)

| PARAMETER | TEST CONDITIONS | TL750M05C, TL751M05C TL750M05Q, TL751M05Q | | | UNIT |
|---|---|---|---|---|---|
| | | MIN | TYP | MAX | |
| Output voltage | $T_J$ = 25°C | 4.95 | 5 | 5.05 | V |
| | $T_J$ = MIN to MAX† | 4.9 | | 5.1 | |
| Input voltage regulation | $V_I$ = 9 V to 16 V, $I_O$ = 250 mA | | 10 | 25 | mV |
| | $V_I$ = 6 V to 26 V, $I_O$ = 250 mA | | 12 | 50 | |
| Ripple rejection | $V_I$ = 8 V to 18 V, f = 120 Hz | 50 | 55 | | dB |
| Output voltage regulation | $I_O$ = 5 mA to 750 mA | | 20 | 50 | mV |
| Dropout voltage | $I_O$ = 500 mA | | | 0.5 | V |
| | $I_O$ = 750 mA | | | 0.6 | |
| Output noise voltage | f = 10 Hz to 100 kHz | | 500 | | µV |
| Bias current | $I_O$ = 750 mA | | 60 | 75 | mA |
| | $I_O$ = 10 mA | | | 5 | |
| Bias current (TL751M05C and TL751M05Q only) | $\overline{ENABLE}$ $V_{IH}$ ≥ 2 V | | | 200 | µA |

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

NOTE 2: Pulse-testing techniques maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.1-µF capacitor across the input and a 10-µF tantalum capacitor on the output with equivalent series resistance within the guidelines shown in Figure 3.

## electrical characteristics, $V_I$ = 14 V, $I_O$ = 300 mA, $\overline{ENABLE}$ at 0 V for TL751M08, $T_J$ = 25°C (unless otherwise noted) (see Note 2)

| PARAMETER | TEST CONDITIONS | TL750M08x, TL751M08x | | | UNIT |
|---|---|---|---|---|---|
| | | MIN | TYP | MAX | |
| Output voltage | $T_J$ = 25°C | 7.92 | 8 | 8.08 | V |
| | $T_J$ = MIN to MAX† | 7.84 | | 8.16 | |
| Input voltage regulation | $V_I$ = 10 V to 17 V, $I_O$ = 250 mA | | 12 | 40 | mV |
| | $V_I$ = 9 V to 26 V, $I_O$ = 250 mA | | 15 | 68 | |
| Ripple rejection | $V_I$ = 11 V to 21 V, f = 120 Hz | 50 | 55 | | dB |
| Output voltage regulation | $I_O$ = 5 mA to 750 mA | | 24 | 80 | mV |
| Dropout voltage | $I_O$ = 500 mA | | | 0.5 | V |
| | $I_O$ = 750 mA | | | 0.6 | |
| Output noise voltage | f = 10 Hz to 100 kHz | | 500 | | µV |
| Bias current | $I_O$ = 750 mA | | 60 | 75 | mA |
| | $I_O$ = 10 mA | | | 5 | |
| Bias current (TL751Mxx only) | $\overline{ENABLE}$ $V_{IH}$ ≥ 2 V | | | 200 | µA |

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

NOTE 2: Pulse-testing techniques maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.1-µF capacitor across the input and a 10-µF tantalum capacitor on the output with equivalent series resistance within the guidelines shown in Figure 3.

## electrical characteristics, $V_I$ = 14 V, $I_O$ = 300 mA, $\overline{ENABLE}$ at 0 V for TL751M10, $T_J$ = 25°C (unless otherwise noted) (see Note 2)

| PARAMETER | TEST CONDITIONS | TL750M10x, TL751M10x | | | UNIT |
|---|---|---|---|---|---|
| | | MIN | TYP | MAX | |
| Output voltage | $T_J$ = 25°C | 9.9 | 10 | 10.1 | V |
| | $T_J$ = MIN to MAX† | 9.8 | | 10.2 | |
| Input voltage regulation | $V_I$ = 12 V to 18 V, $I_O$ = 250 mA | | 15 | 43 | mV |
| | $V_I$ = 11 V to 26 V, $I_O$ = 250 mA | | 20 | 75 | |
| Ripple rejection | $V_I$ = 13 V to 23 V, f = 120 Hz | 50 | 55 | | dB |
| Output voltage regulation | $I_O$ = 5 mA to 750 mA | | 30 | 100 | mV |
| Dropout voltage | $I_O$ = 500 mA | | | 0.5 | V |
| | $I_O$ = 750 mA | | | 0.6 | |
| Output noise voltage | f = 10 Hz to 100 kHz | | 1000 | | µV |
| Bias current | $I_O$ = 750 mA | | 60 | 75 | mA |
| | $I_O$ = 10 mA | | | 5 | |
| Bias current (TL751Mxx only) | $\overline{ENABLE}$ $V_{IH} \geq 2$ V | | | 200 | µA |

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

NOTE 2: Pulse-testing techniques maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.1-µF capacitor across the input and a 10-µF tantalum capacitor on the output with equivalent series resistance within the guidelines shown in Figure 3.

## electrical characteristics, $V_I$ = 14 V, $I_O$ = 300 mA, $\overline{ENABLE}$ at 0 V for TL751M12, $T_J$ = 25°C (unless otherwise noted) (see Note 2)

| PARAMETER | TEST CONDITIONS | TL750M12C, TL751M12C<br>TL750M12Q, TL751M12Q | | | UNIT |
|---|---|---|---|---|---|
| | | MIN | TYP | MAX | |
| Output voltage | $T_J$ = 25°C | 11.88 | 12 | 12.12 | V |
| | $T_J$ = MIN to MAX† | 11.76 | | 12.24 | |
| Input voltage regulation | $V_I$ = 14 V to 19 V, $I_O$ = 250 mA | | 15 | 43 | mV |
| | $V_I$ = 13 V to 26 V, $I_O$ = 250 mA | | 20 | 78 | |
| Ripple rejection | $V_I$ = 13 V to 23 V, f = 120 Hz | 50 | 55 | | dB |
| Output voltage regulation | $I_O$ = 5 mA to 750 mA | | 30 | 120 | mV |
| Dropout voltage | $I_O$ = 500 mA | | | 0.5 | V |
| | $I_O$ = 750 mA | | | 0.6 | |
| Output noise voltage | f = 10 Hz to 100 kHz | | 1000 | | µV |
| Bias current | $I_O$ = 750 mA | | 60 | 75 | mA |
| | $I_O$ = 10 mA | | | 5 | |
| Bias current (TL751Mxx only) | $\overline{ENABLE}$ $V_{IH} \geq 2$ V | | | 200 | µA |

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

NOTE 2: Pulse-testing techniques maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.1-µF capacitor across the input and a 10-µF tantalum capacitor on the output with equivalent series resistance within the guidelines shown in Figure 3.

## electrical characteristics, $V_I$ = 14 V, $I_O$ = 300 mA, $\overline{ENABLE}$ at 0 V, $T_J$ = 25°C (unless otherwise noted) (see Note 2)

| PARAMETER | TEST CONDITIONS | | | TL751M05M | | | UNIT |
|---|---|---|---|---|---|---|---|
| | | | | MIN | TYP | MAX | |
| Output voltage | $V_I$ = 6 V to 26 V, | $I_O$ = 0 mA to 480 mA | $T_J$ = 25°C | 4.95 | 5 | 5.05 | V |
| | | | $T_J$ = –55°C to 125°C | 4.9 | | 5.1 | |
| Input voltage regulation | $V_I$ = 9 V to 16 V, | $I_O$ = 250 mA | | | 10 | 25 | mV |
| | $V_I$ = 6 V to 26 V, | $I_O$ = 250 mA | | | 12 | 50 | |
| Ripple rejection | $V_I$ = 8 V to 18 V, | f = 120 Hz | | 50* | 55 | | dB |
| Output voltage regulation | $I_O$ = 5 mA to 480 mA | | | | 20 | 50 | mV |
| Dropout voltage | $I_O$ = 480 mA | | | | | 0.5 | V |
| Output noise voltage | f = 10 Hz to 100 kHz | | | | 500 | | μV |
| Bias current | $I_O$ = 480 mA | | | | 60 | 75 | mA |
| | $I_O$ = 10 mA | | | | | 5 | |
| | $\overline{ENABLE}$ $V_{IH}$ ≥ 2 V | | | | | 200 | μA |

* This parameter is not production tested.

NOTE 2: Pulse-testing techniques maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.1-μF capacitor across the input and a 10-μF tantalum capacitor on the output with equivalent series resistance within the guidelines shown in Figure 3.

## electrical characteristics, $V_I$ = 14 V, $I_O$ = 300 mA, $\overline{ENABLE}$ at 0 V, $T_J$ = 25°C (unless otherwise noted) (see Note 2)

| PARAMETER | TEST CONDITIONS | | | TL751M12M | | | UNIT |
|---|---|---|---|---|---|---|---|
| | | | | MIN | TYP | MAX | |
| Output voltage | $V_I$ = 13 V to 26 V, | $I_O$ = 0 mA to 480 mA | $T_J$ = 25°C | 11.88 | 12 | 12.12 | V |
| | | | $T_J$ = –55°C to 125°C | 11.76 | | 12.24 | |
| Input voltage regulation | $V_I$ = 14 V to 19 V, | $I_O$ = 250 mA | | | 15 | 43 | mV |
| | $V_I$ = 13 V to 26 V, | $I_O$ = 250 mA | | | 20 | 78 | |
| Ripple rejection | $V_I$ = 13 V to 23 V, | f = 120 Hz | | 50* | 55 | | dB |
| Output voltage regulation | $I_O$ = 5 mA to 480 mA | | | | 30 | 120 | mV |
| Dropout voltage | $I_O$ = 480 mA | | | | | 0.5 | V |
| Output noise voltage | f = 10 Hz to 100 kHz | | | | 1000 | | μV |
| Bias current | $I_O$ = 480 mA | | | | 60 | 75 | mA |
| | $I_O$ = 10 mA | | | | | 5 | |
| | $\overline{ENABLE}$ $V_{IH}$ ≥ 2 V | | | | | 200 | μA |

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

NOTE 2: Pulse-testing techniques maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.1-μF capacitor across the input and a 10-μF tantalum capacitor on the output with equivalent series resistance within the guidelines shown in Figure 3.

### electrical characteristics, $V_I$ = 14 V, $I_O$ = 300 mA, $\overline{ENABLE}$ at 0 V, $T_J$ = 25°C (unless otherwise noted) (see Note 2)

| PARAMETER | TEST CONDITIONS | | TL750M05Y | | | UNIT |
|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | |
| Output voltage | | | | 5 | | V |
| Input voltage regulation | $V_I$ = 9 V to 16 V, | $I_O$ = 250 mA | | 10 | | mV |
| | $V_I$ = 6 V to 26 V, | $I_O$ = 250 mA | | 12 | | |
| Ripple rejection | $V_I$ = 8 V to 18 V, | f = 120 Hz | | 55 | | dB |
| Output voltage regulation | $I_O$ = 5 mA to 750 mA | | | 20 | | mV |
| Output noise voltage | f = 10 Hz to 100 kHz | | | 500 | | µV |
| Bias current | $I_O$ = 750 mA | | | 60 | | mA |

NOTE 2: Pulse-testing techniques maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.1-µF capacitor across the input and a 10-µF tantalum capacitor on the output with equivalent series resistance within the guidelines shown in Figure 3.

### electrical characteristics, $V_I$ = 14 V, $I_O$ = 300 mA, $\overline{ENABLE}$ at 0 V, $T_J$ = 25°C (unless otherwise noted) (see Note 2)

| PARAMETER | TEST CONDITIONS | | TL750M08Y | | | UNIT |
|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | |
| Output voltage | | | | 8 | | V |
| Input voltage regulation | $V_I$ = 10 V to 17 V, | $I_O$ = 250 mA | | 12 | | mV |
| | $V_I$ = 9 V to 26 V, | $I_O$ = 250 mA | | 15 | | |
| Ripple rejection | $V_I$ = 11 V to 21 V, | f = 120 Hz | | 55 | | dB |
| Output voltage regulation | $I_O$ = 5 mA to 750 mA | | | 24 | | mV |
| Output noise voltage | f = 10 Hz to 100 kHz | | | 500 | | µV |
| Bias current | $I_O$ = 750 mA | | | 60 | | mA |

NOTE 2: Pulse-testing techniques maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.1-µF capacitor across the input and a 10-µF tantalum capacitor on the output with equivalent series resistance within the guidelines shown in Figure 3.

### electrical characteristics, $V_I$ = 14 V, $I_O$ = 300 mA, $\overline{ENABLE}$ at 0 V, $T_J$ = 25°C (unless otherwise noted) (see Note 2)

| PARAMETER | TEST CONDITIONS | | TL750M10Y | | | UNIT |
|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | |
| Output voltage | | | | 10 | | V |
| Input voltage regulation | $V_I$ = 12 V to 18 V, | $I_O$ = 250 mA | | 15 | | mV |
| | $V_I$ = 11 V to 26 V, | $I_O$ = 250 mA | | 20 | | |
| Ripple rejection | $V_I$ = 13 V to 23 V, | f = 120 Hz | | 55 | | dB |
| Output voltage regulation | $I_O$ = 5 mA to 750 mA | | | 30 | | mV |
| Output noise voltage | f = 10 Hz to 100 kHz | | | 1000 | | µV |
| Bias current | $I_O$ = 750 mA | | | 60 | | mA |

NOTE 2: Pulse-testing techniques maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.1-µF capacitor across the input and a 10-µF tantalum capacitor on the output with equivalent series resistance within the guidelines shown in Figure 3.

## TL751M12Y electrical characteristics, $V_I$ = 14 V, $I_O$ = 300 mA, $\overline{\text{ENABLE}}$ at 0 V, $T_J$ = 25°C (unless otherwise noted) (see Note 2)

| PARAMETER | TEST CONDITIONS | | TL750M12Y | | | UNIT |
|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | |
| Output voltage | | | | 12 | | V |
| Input voltage regulation | $V_I$ = 14 V to 19 V, | $I_O$ = 250 mA | | 15 | | mV |
| | $V_I$ = 13 V to 26 V, | $I_O$ = 250 mA | | 20 | | |
| Ripple rejection | $V_I$ = 13 V to 23 V, | f = 120 Hz | | 55 | | dB |
| Output voltage regulation | $I_O$ = 5 mA to 750 mA | | | 30 | | mV |
| Output noise voltage | f = 10 Hz to 100 kHz | | | 1000 | | µV |
| Bias current | $I_O$ = 750 mA | | | 60 | | mA |

NOTE 2: Pulse-testing techniques maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.1-µF capacitor across the input and a 10-µF tantalum capacitor on the output with equivalent series resistance within the guidelines shown in Figure 3.

## PARAMETER MEASUREMENT INFORMATION

The TL751Mxx is a low-dropout regulator. This means that the capacitance loading is important to the performance of the regulator because it is a vital part of the control loop. The capacitor value and the equivalent series resistance (ESR) both affect the control loop and must be defined for the load range and the temperature range. Figures 3 and 4 can establish the capacitance value and ESR range for the best regulator performance.

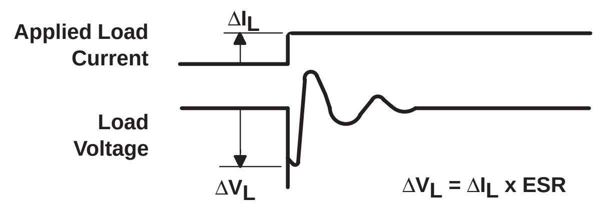
Figure 3 shows the recommended range of ESR for a given load with a 10-µF capacitor on the output. This figure also shows a maximum ESR limit of 2 Ω and a load-dependent minimum ESR limit.

For applications with varying loads, the lightest load condition should be chosen since it is the worst case. Figure 4 shows the relationship of the reciprocal of ESR to the square root of the capacitance with a minimum capacitance limit of 10 µF and a maximum ESR limit of 2 Ω. This figure establishes the amount that the minimum ESR limit shown in Figure 3 can be adjusted for different capacitor values. For example, where the minimum load needed is 200 mA, Figure 4 suggests an ESR range of 0.8 Ω to 2 Ω for 10 µF. Figure 4 shows that changing the capacitor from 10 µF to 400 µF can change the ESR minimum by greater than 3/0.5 (or 6). Therefore, the new minimum ESR value is 0.8/6 (or 0.13 Ω ). This now allows an ESR range of 0.13 Ω to 2 Ω , achieving an expanded ESR range by using a larger capacitor at the output. For better stability in low-current applications, a small resistance placed in series with the capacitor (see Table 1) is recommended, so that ESRs better approximate those shown in Figures 3 and 4.

## PARAMETER MEASUREMENT INFORMATION

### Table 1. Compensation for Increased Stability at Low Currents

| MANUFACTURER | CAPACITANCE | ESR TYP | PART NUMBER | ADDITIONAL RESISTANCE |
|---|---|---|---|---|
| AVX | 15 µF | 0.9 Ω | TAJB156M010S | 1 Ω |
| KEMET | 33 µF | 0.6 Ω | T491D336M010AS | 0.5 Ω |




**OUTPUT CAPACITOR**
**EQUIVALENT SERIES RESISTANCE (ESR)**
**vs**
**LOAD CURRENT RANGE**

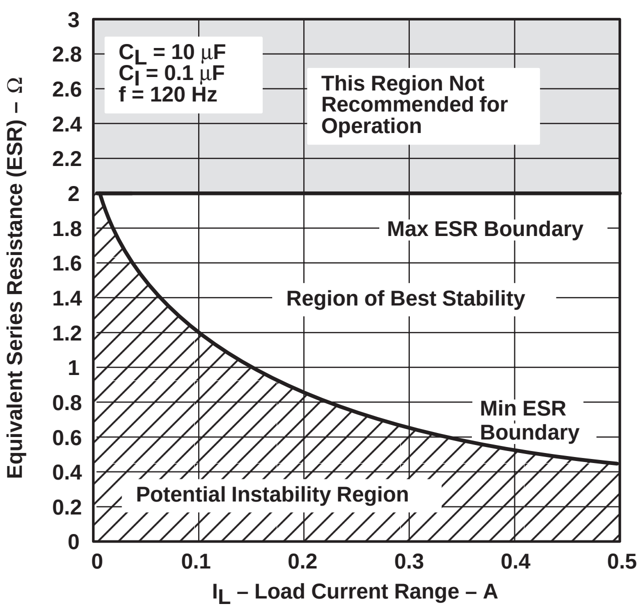



**Figure 3**

**STABILITY**
**vs**
**EQUIVALENT SERIES RESISTANCE (ESR)**

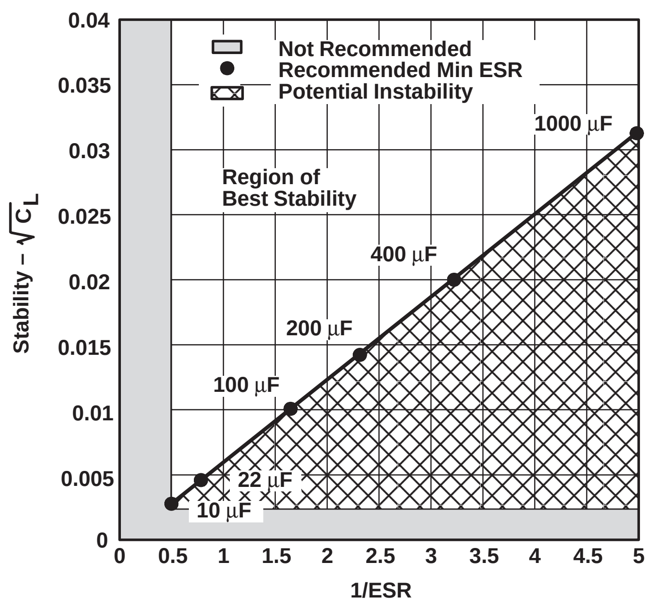



**Figure 4**

## TYPICAL CHARACTERISTICS

### Table of Graphs

| | | FIGURE |
|---|---|---|
| Transient input voltage vs Time | | 5 |
| Output voltage vs Input voltage | | 6 |
| Input current vs Input voltage | $I_O$ = 10 mA | 7 |
| | $I_O$ = 100 mA | 8 |
| Dropout voltage vs Output current | | 9 |
| Quiescent current vs Output current | | 10 |
| Load transient response | | 11 |
| Line transient response | | 12 |

**TRANSIENT INPUT VOLTAGE vs TIME**

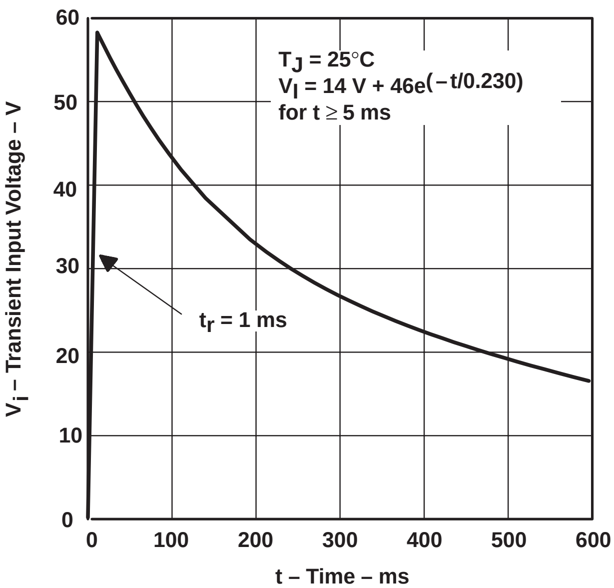



**Figure 5**

**OUTPUT VOLTAGE vs INPUT VOLTAGE**

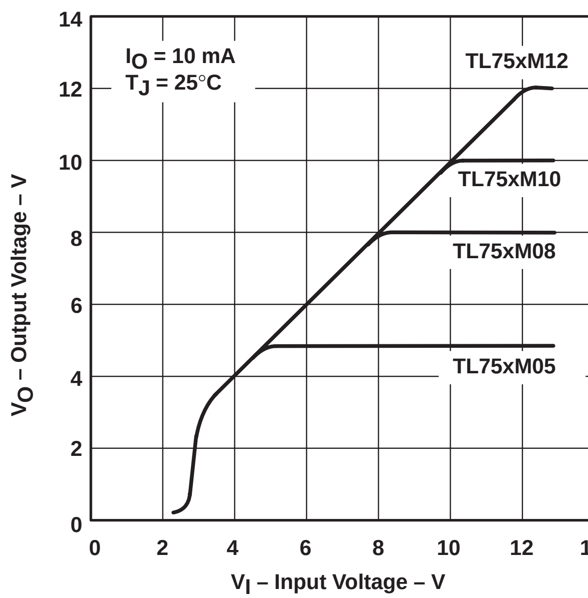



**Figure 6**

## TYPICAL CHARACTERISTICS

**INPUT CURRENT vs INPUT VOLTAGE**

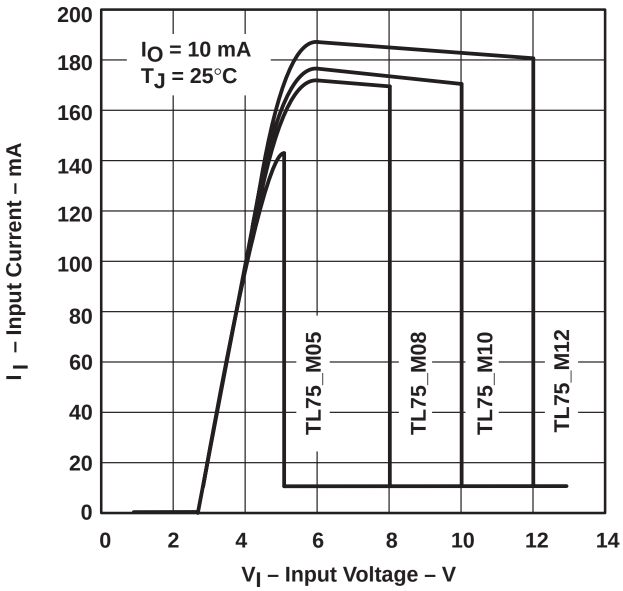



**Figure 7**

**INPUT CURRENT vs INPUT VOLTAGE**

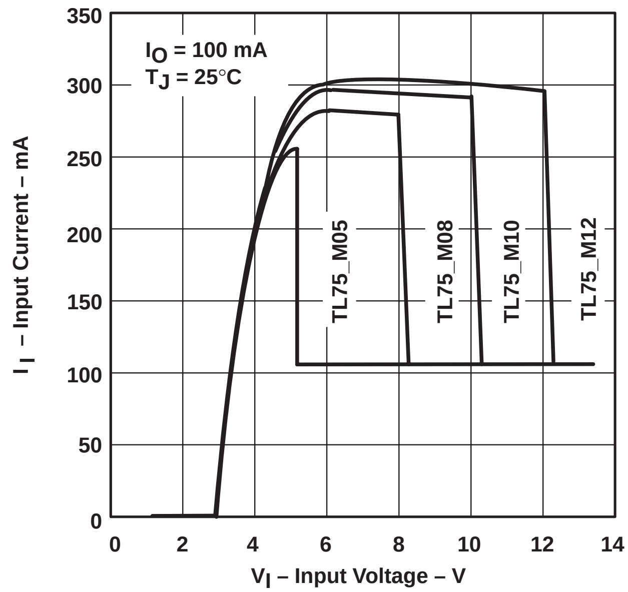



**Figure 8**

**DROPOUT VOLTAGE vs OUTPUT CURRENT**

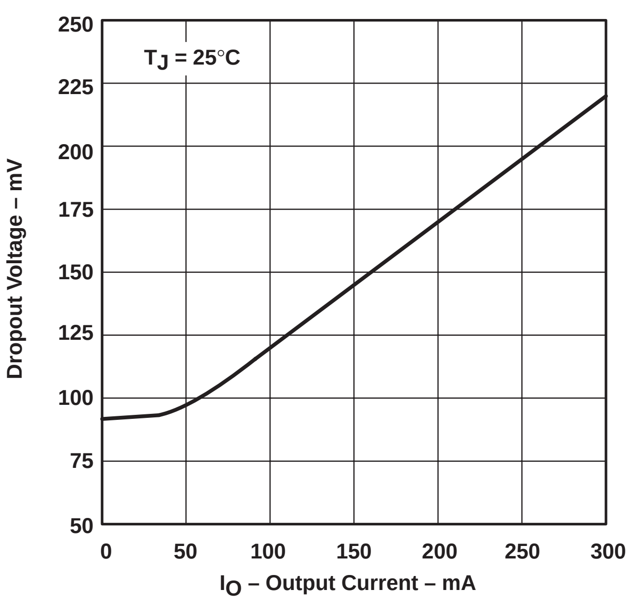



**Figure 9**

**QUIESCENT CURRENT vs OUTPUT CURRENT**

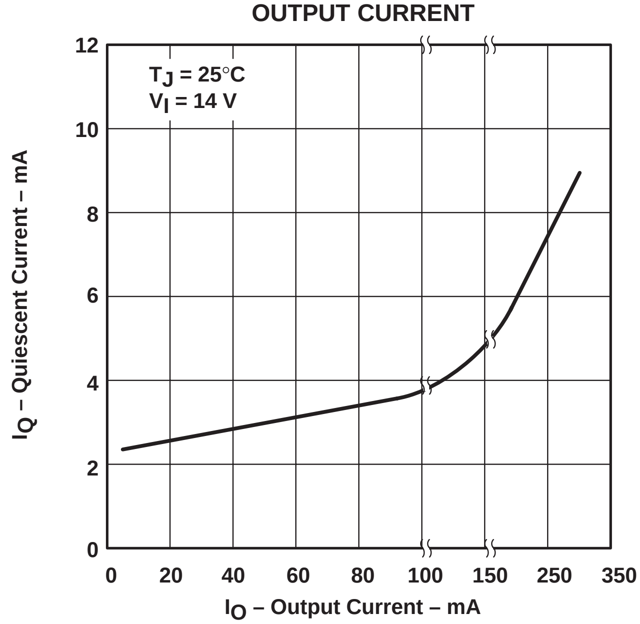



**Figure 10**

## TYPICAL CHARACTERISTICS

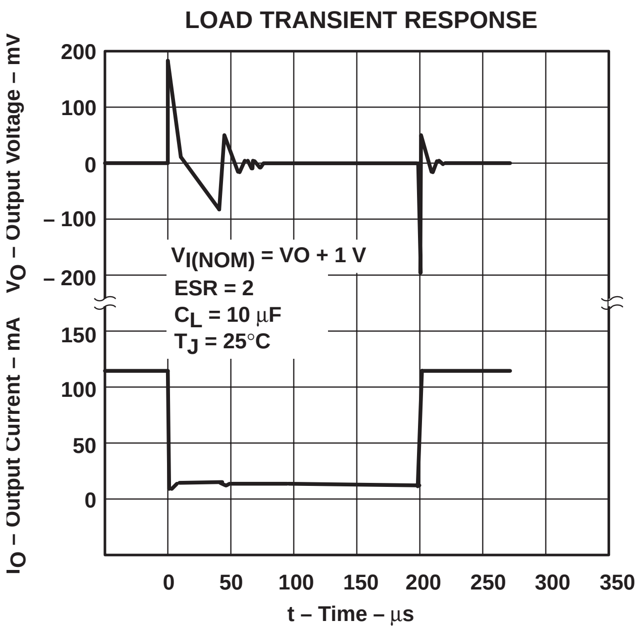



Figure 11

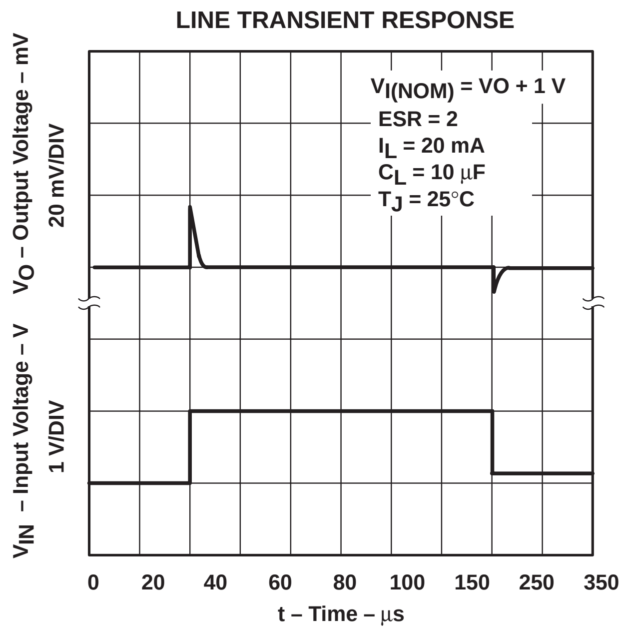



Figure 12

## IMPORTANT NOTICE